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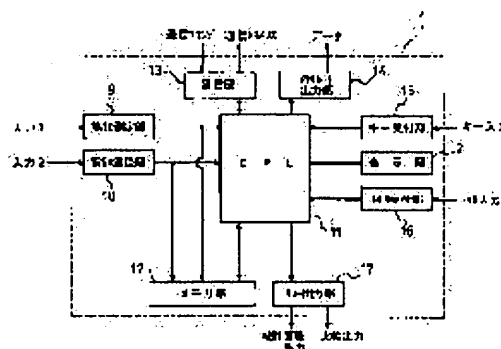
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(54) **OPERATION STATE MONITORING DEVICE**

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an operation state monitoring device which performs statistic processing at a manufacturing site in real time without needing to sends measured data to a host device to perform statistic processing.
SOLUTION: A CPU 11 performs operation processing that is needed for statistic processing, e.g. the creation of histogram, scatter diagram and xber-R management diagram to analog input data from a sensor, etc., also stores statistic data that is undergone operation processing and measured data from 1st and 2nd measuring parts 9 and 10 in a memory part 12, responds to an operation input for an display out and displays the histogram, the scatter diagram and the xber-R management diagram on a display part 2.

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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to suitable system-operating-status supervisory equipment to supervise system operating status, such as a manufacturing installation, for example, in a production site.
[0002]
[Description of the Prior Art] Generally, statistics processing of the various measurement data, such as temperature in a production process and a pressure, was carried out, the variation has been grasped in the production control in a production site etc., and it uses for control of a manufacturing installation etc.
[0003] The input from various kinds of sensors is once accumulated in the so-called data logger etc., in measuring various data and carrying out statistics processing in this way conventionally, by the communication link, based on this database, delivery and a host computer perform statistics processing to the host computer which is a high order device about the data of this data logger, and collection are recording of the measurement data is carried out, and a database is created, and they create and show [distribution is computed, or] the histogram to it.
[0004]
[Problem(s) to be Solved by the Invention] However, in such a conventional example, since a host computer performs statistics processing and the display output of that result is carried out, the data which carried out statistics processing cannot be grasped on real time in a production site, but, for this reason, there is a difficulty that a manufacturing installation cannot be adjusted quickly.
[0005] In view of an above-mentioned point, it succeeds in this invention, it is high order devices, such as a host computer, and it aims at offering the system-operating-status supervisory equipment which carries out statistics processing and could be made to carry out the display output of the measurement data to real time in a production site, without performing statistics processing.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, it constitutes from this invention as follows.
[0007] That is, the system-operating-status supervisory equipment of this invention is equipped with an operation means to perform the operation for statistics processing to the input data of an analog, a storage means to memorize the calculated statistical data, and a display means to display the memorized statistical data.
[0008] While performing an operation for said operation means to create a histogram based on said input data, as for said display means, considering as the configuration which displays said histogram is desirable.
[0009] Moreover, while said at least two kinds of input data is given and performing an operation for said operation means to create the scatter diagram showing correlation of two kinds of said input data, as for said display means, it is desirable to consider as the configuration which displays said scatter diagram, and it is still more desirable to indicate the frequency in a scatter diagram by gradation.
[0010] Moreover, while an operation means calculates the average and range of input data, when either [at least] said average or the range exceeds the control limit, it is still more desirable [a means / as for said display means, it is desirable to consider as the configuration which displays the control chart of said average and the range, and] to give an alarm output.

[0011] It is desirable to consider as a configuration equipped with the means of communications which transmits the statistical data memorized by the storage means to a high order device by communication link, and it is desirable to consider as a configuration equipped with the output section which outputs the statistical data memorized by the storage means to a memory card.

[0012] Since it has an operation means to perform the operation for statistics processing to input data, a storage means to memorize the calculated statistical data, and a display means display the memorized statistical data according to the system-operating-status supervisory equipment of this invention, it is not necessary to transmit to a high order device and to perform statistics processing, and statistics processing will be carried out with the system-operating-status supervisory equipment concerned, and it can display.

[0013] Since input data displays the statistical data which are analog data, such as temperature in a production line, a pressure, or a flow rate, and it is as a result of those statistics processings on a display means, it can adjust the manufacturing installation in a production line quickly based on it.

[0014] Moreover, while performing an operation for an operation means to create a histogram, since said histogram is displayed, a display means can grasp change of a condition easily with the displayed histogram.

[0015] Moreover, while said at least two kinds of input data is given and an operation means performs the operation for creating the scatter diagram showing correlation of two kinds of said input data, since said display means displays said scatter diagram, a distribution situation can be grasped, and since it indicates by gradation, it can grasp at a glance further.

[0016] Furthermore, since an alarm output is given when either [at least] said average or the range exceeds the control limit while being able to grasp a serial change, since said display means displays the control chart of said average and the range while said operation means calculates the average and range of said input data, measures can be taken.

[0017] Moreover, since it has the means of communications which transmits the statistical data memorized by said storage means to a high order device by communication link, further various statistics processings can be performed by the high order device.

[0018] Since it has the output section which outputs the statistical data memorized by said storage means to a memory card, the data exceeding capacity are storable in a memory card.

[0019]
[Embodiment of the Invention] Hereafter, a drawing explains the gestalt of operation of this invention to a detail.

[0020] Drawing 1 is the front view of the system-operating-status supervisory equipment 1 concerning the gestalt of one operation of this invention.

[0021] While the system-operating-status supervisory equipment 1 of the gestalt of this operation has the rectangular display 2 which performs various kinds of displays, such as data which carried out statistics processing like the after-mentioned, a current value, or a menu, to the method of that right Each actuation key 3 of the four directions which specify display positions, such as migration of cursor, and a graph, It has the definite key 6 which makes the set point etc. decide an increment or the rise key 4 which carries out a decrement and the down key 5, the set point, etc., and the clear key 7 which clears the set point etc., and the insertion opening 8 which inserts a memory card is further formed in the method of the right.

[0022] In the tooth-back side (not shown) of this system-operating-status supervisory equipment 1, the terminal area for I/O is arranged, and while the analog input from various kinds of sensors etc. is inputted, it can communicate with high order devices, such as a personal computer, if needed.

[0023] Moreover, this system-operating-status supervisory equipment 1 displays the comparison output (L, PASS, H) of the input value from various sensors etc., and the set-up compound value on the above-mentioned display 2 like the conventional digital panel meter.

[0024] Drawing 2 is the block diagram of the system-operating-status supervisory equipment 1 of drawing 1 , and gives the same reference mark to the part corresponding to drawing 1 .

[0025] The system-operating-status supervisory equipment 1 of the gestalt of this operation from the sensor installed in the manufacture machine etc. in the production line For example, while two kinds of analog inputs, temperature, a pressure, etc., are given and the digital data from the 1st and 2nd test section 9 and 10 which carries out A/D conversion of each analog input, and each test sections 9 and 10 is given CPU11 which controls

each part, and the memory section 12 which memorizes the statistical data to which the operation for statistics processing was performed like the input data from the 1st and 2nd test section 9 and 10, or the after-mentioned, With the communications department 13 for communicating among high order devices, such as a host computer and a programmable controller The memory card output section 14 which outputs the raw data or the statistical data of the memory section 12 to a memory card, The key reception section 15 which receives the key input of various above-mentioned keys, and the above-mentioned display 2 which performs a liquid crystal display, When a trigger input prescribes initiation or termination of statistics processing and the result of the trigger reception section 16 to which said trigger input is given, the same comparison output as the conventional digital panel meter, and the below-mentioned statistics processing exceeds the control limit It has the relay output section 17 which outputs a statistics alarm output.

[0026] CPU11 has Programs ROM and RAM, and it gives a relay output through the relay output section 17 while it displays the comparison output (L, PASS, H) on a display 2 like the conventional digital panel meter as compared with the input value from a sensor etc., and the set-up compound value.

[0027] In order to carry out statistics processing and to be able to carry out the display output of the input data to real time by high order devices, such as a host computer, in a production site, without performing statistics processing, it constitutes from system-operating-status supervisory equipment 1 of the gestalt of this operation as follows.

[0028] That is, while performing conventionally data processing for the statistics processing currently performed in high order devices, such as a host computer, in CPU11 as an operation means, he is trying to memorize the statistical data which carried out data processing in the memory section 12 with the gestalt of this operation with the raw data given from the 1st and 2nd test section 9 and 10.

[0029] With the gestalt of this operation, CPU11 performs the following operations for statistics processing. That is, the input data inputted is incorporated with the sampling period set up beforehand, and the frequency of the rank to which the measurement data belongs whenever it calculates and memorizes the frequency of each rank and measurement data is obtained, while the incorporated measurement data performs a rank division of whether it belongs to which rank of two or more ranks is updated, and it memorizes as a statistical data. The number of this measurement data may be set up beforehand, or an above-mentioned trigger input may prescribe it. In addition, with the gestalt of this operation, whenever measurement data is obtained, the average and distribution are also calculated collectively, and updating storage is carried out.

[0030] Thus, to two or more ranks, while carrying out the rank division of the measurement data, the frequency of each rank is calculated, it is memorized, the actuation input for a display is answered, and CPU11 reads the statistical data of the memory section 12, and creates and displays frequency tables, such as a histogram shown in drawing 3 , on a display 2. In addition, in this drawing 3 , the rank division of the measurement data is carried out at the rank of 10, the frequency of each rank is calculated and displayed, and the average, distribution, etc. are displayed collectively. Moreover, this histogram may be created only about an input, as you may create about each two inputs and while is shown in drawing 3 .

[0031] Furthermore, it is what performs the operation for creating the scatter diagram showing correlation of two kinds of analog inputs, temperature and a pressure, for example with the gestalt of this operation. Incorporate the input data inputted with the sampling period set up beforehand, and while performing a rank division of whether the incorporated measurement data belongs to which rank of two or more ranks beforehand classified by both temperature and pressure The frequency of each rank is calculated, it memorizes in the memory section 12 as a statistical data, and the actuation input for a display is answered. CPU11 The statistical data of the memory section 12 is read, the scatter diagram shown in drawing 4 is created and displayed on a display 2, and the frequency is indicated by gradation in that case. In addition, in this drawing 4 R> 4, each input is classified into 10, respectively, and a rank division is carried out and five levels of gradation displays are performed to a total of 100 ranks in quest of that frequency, and the average, distribution, etc. are combined like the case of a histogram, and it is indicating by the operation. The number of this measurement data may also be set up beforehand, or an above-mentioned trigger input may prescribe it.

[0032] thus, the thing for which the scatter diagram is indicated by creation -- for example, it becomes possible to adjust temperature and a pressure so that it may become normal distribution, and a predicted maintenance can be performed noting that there is a possibility that a defect may occur, when normal and distribution has

separated [this] from from by grasping the scatter diagram when the manufacturing installation has operated normally beforehand.

[0033] And since the frequency is indicated by gradation, the degree of distribution can be grasped at a glance.

[0034] Moreover, with the gestalt of this operation, incorporate the input data inputted with the sampling period set up beforehand, and while calculating the average (xber) by the time basis or volume unit of the incorporated measurement data The range (R) which is the difference of max and min is calculated, it memorizes in the memory section 12 as a statistical data, and the actuation input for a display is answered. CPU11 It is what creates and displays the control chart of the average (xber) which reads the statistical data of the memory section 12 and is shown in a display 2 at <u>drawing 5</u> , and the range (R). When each control limit (UCL, LCL) of the upper part set up beforehand and the lower part is displayed on that occasion and this control limit is exceeded at it, he is trying to give an above-mentioned statistics alarm output. In addition, the operation of this average and the range may follow each input of two inputs, and may follow only one input.

[0035] Thus, since an average and time series change of the range can be easily grasped with the so-called xber-R control chart, before a defect occurs, it becomes possible to take proper measures, such as adjustment of a manufacturing installation, and a quality of conformance can be raised.

[0036] <u>Drawing 6</u> is the flow chart of the above statistics operation, and first, if a power source is switched on Save the inputted measurement data in the memory section 12 (step n1), and the comparison test of measurement data and a compound value is performed (step n2). The comparison output (L, PASS, H) according to a judgment result is displayed or relay outputted (step n3), it judges whether the number of measurement data reached the number of the setting population (step n4), and when having not reached, it returns to step n1.

[0037] When the number of the setting population is reached, while clearing the number of measurement data zero times A statistical data, for example, the above-mentioned average and the above-mentioned range, is calculated (step n5). Save the calculated statistical data in the memory section 12 (step n6), judge whether the control limit to which the average and the range are set was exceeded (step n7), and when it exceeds A statistics alarm output is displayed or relay outputted (step n8), it judges whether the power source was severed (step n9), and when not severed, it returns to step n1.

[0038] Since data processing of the input data inputted with the gestalt of this operation as mentioned above is carried out, it is stored in the memory section 12 and a statistical data is displayed as a histogram, a scatter diagram, or a xber-R control chart if needed, based on these displays, it becomes possible to carry out adjustment of a manufacturing installation etc. to real time in a manufacture site, and a quality of conformance can be raised.

[0039] In addition, when it has the communications department 13 as mentioned above and there is a Request to Send of data from a high order device, the gestalt of this operation can transmit the raw data or the statistical data of the memory section 12 to a high order device through the communications department 13, and can perform still more detailed analysis processing by the high order device.

[0040] Although it was made to indicate by the operation about all a histogram, scatter diagrams, the averages, and range with the gestalt of above-mentioned operation, as a gestalt of other operations of this invention, it may be made to indicate by the operation about any one, and, of course, the number of inputs is not restricted to above-mentioned two, either.

[0041] Moreover, this invention of it being made to perform not only above-mentioned data processing but other suitable data processing for statistics processing is natural.

[0042]

[Effect of the Invention] Since measurement data can be transmitted to a high order device like the conventional example, it is not necessary to perform statistics processing and the statistical data which carried out statistics processing in the manufacture site can be displayed as mentioned above according to this invention, based on the display, it becomes possible to perform adjustment of a manufacturing installation etc. quickly, and a quality of conformance can be raised.

[0043] Prior measures can be taken while being able to grasp a serial change by being able to perform a predicted maintenance and displaying the control chart of an average and the range further by grasping a distribution situation and comparing with the scatter diagram of forward always by being able to grasp change

of a condition easily and displaying a scatter diagram by displaying a statistical data as a histogram especially.

[Translation done.]